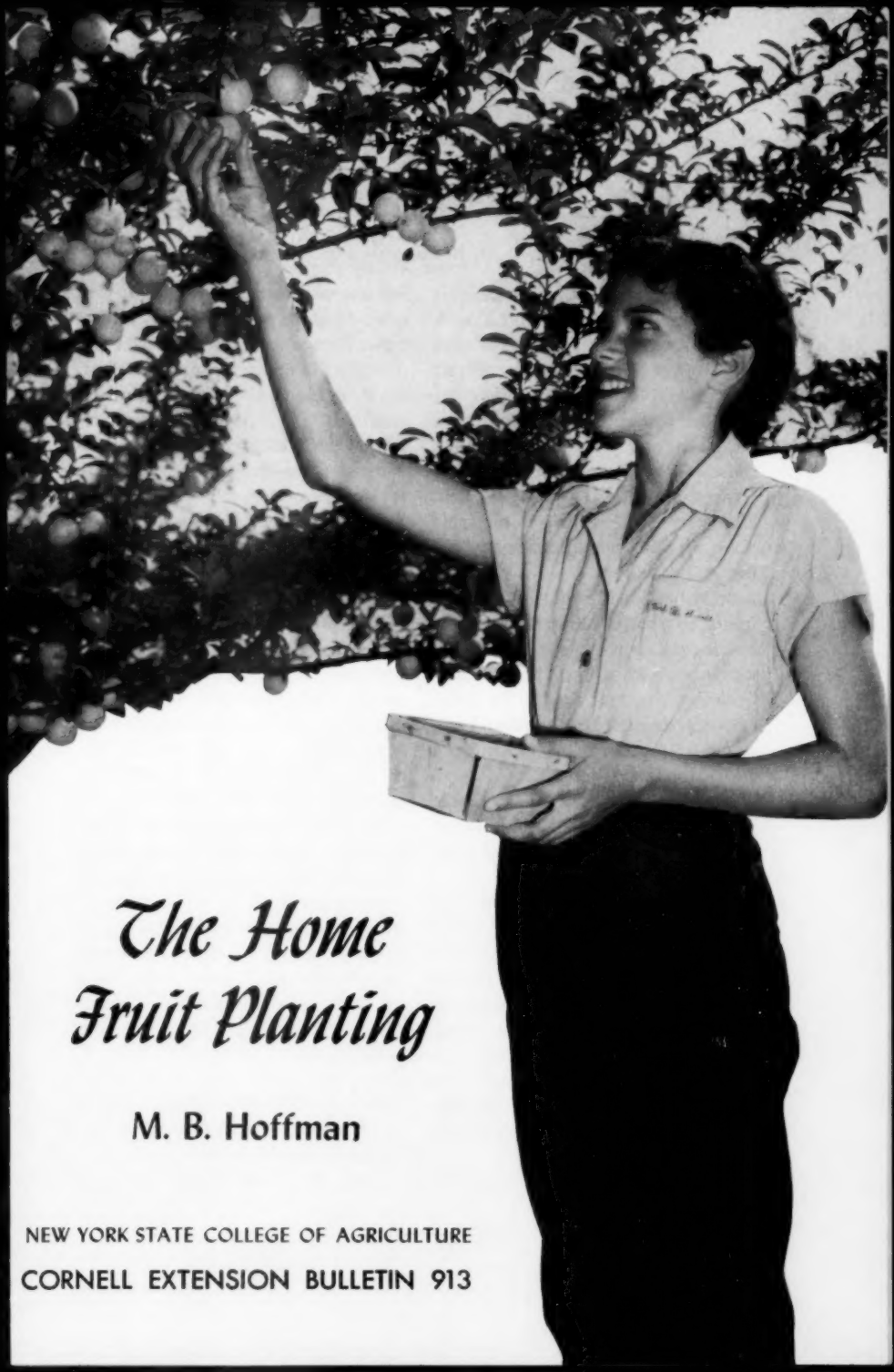

The Home Fruit Planting

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Growing fruit for home use can be an interesting hobby and a profitable venture. Fruit that is allowed to ripen on the plant is of the best eating and culinary quality. In addition to being appetizing, fruits are classed as protective foods because they contain certain substances essential to good health. These reasons justify a home fruit planting wherever there is a place for it.

Strawberries are one of the first fruits to ripen, followed by raspberries, currants, gooseberries, blueberries, cherries, peaches, plums, grapes, pears, and apples. By properly selecting the kinds and varieties of fruit for the home planting, a succession of fresh fruit of high dessert quality may be available through most of the summer. Surpluses can be canned or frozen for winter use.

There are, however, certain limitations and precautions that should be considered carefully when contemplating a planting. The success or failure of a home fruit planting is determined by: (1) the availability of a suitable site and soils, (2) the selection of those fruits and varieties adapted to the locality, (3) pest control, and (4) cultural care.

In some sections of New York State, peaches, cherries, and the more tender varieties of other tree fruits do not withstand winter temperatures. Furthermore, tree fruits are exacting in their spray requirements. It is not possible to control insects and diseases on large trees without power-driven spray machinery that would not be justified for a small home planting. This is especially true for apples because both leaves and fruit are attacked by the scab fungus and by a number of insects. Dwarf trees seem to offer some solution to this problem because pest-control treatments could be applied with small hand-operated equipment. Dwarf trees occupy less space and bear at an earlier age than do standard trees on seedling stocks.

The small fruits, such as strawberries, raspberries, blueberries, currants, and grapes offer definite advantages for garden culture. They require a minimum of space for the amount of fruit produced and bear one or two years after planting. Also, it is easier to control pests on these than on tree fruits.

Site and Soil

The site of the home fruit planting is usually determined by circumstances. Nearness to the house is

desirable, but if the building is on low ground where frosts are likely to occur it is better, if possible, to plant on higher land.

Fruit plants differ from crop plants in that they are perennials and their root systems live in the soil throughout the year. Because fruit plants start their top growth early, a correspondingly early and vigorous root growth is needed to supply the tops with increasing amounts of water. The soil must have, in addition to available water, an adequate supply of air so the roots can "breathe" and thus release the energy that is used by them when they grow and absorb water and nutrients. A soil that is waterlogged or saturated during the spring does not contain the air needed for the proper functioning of the roots of fruit plants. The soil should have enough internal drainage to allow the roots to start unimpaired activity early in the spring and to continue this activity until leaf fall in late autumn. Otherwise, maximum growth and production will not be realized. In obtaining satisfactory performance of fruit plants there is no substitute for a well-drained soil.

Climatic Requirements

Minimum winter temperatures determine the areas in which most fruit plants can be grown with success. Isothermal lines representing the minimum temperatures recorded for the State prior to the severe winter of 1933–34 are shown on the map in figure 1. The winter of 1933–34 was so unusual that the records of other years are more in line with the probability.

Only the hardiest varieties of apples, such as Yellow Transparent, Duchess, Wealthy, Northwest Greening, and Cortland, can withstand winter temperatures of 30 degrees below zero (−30° F.) or colder, and even these varieties may suffer from winter injury at such temperatures. The less hardy varieties of apples, such as Rhode Island Greening and Northern Spy, and pears can usually withstand winters during which the minimum temperature goes to 25 degrees below zero (−25° F.). Sour cherries and certain plums may suffer winter injury when the minimum temperature goes lower than 20 degrees below zero (−20° F.). A temperature of 20 degrees below zero would also result in damage to the wood of sweet cherry and peach trees, and the flower buds of peaches are usually killed when winter temperatures reach 15 degrees below zero (−15° F.). The exact temperature that the various species of tree fruits withstand varies greatly, depending on the amount of hardiness acquired at the time of the freeze as well as other environmental factors.

Those areas of the State with the coldest winters also have the shortest growing season. Figure 2 shows the average date of the last spring frost. The late date of the last spring frost in some sections is

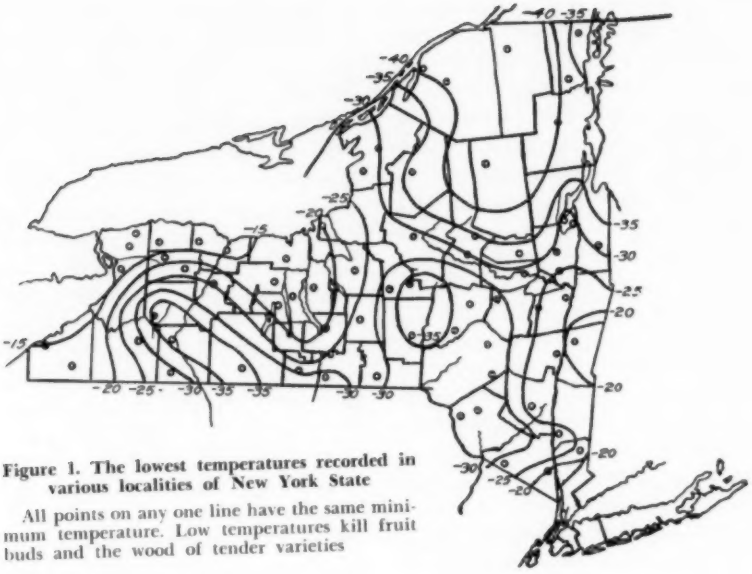


Figure 1. The lowest temperatures recorded in various localities of New York State

All points on any one line have the same minimum temperature. Low temperatures kill fruit buds and the wood of tender varieties

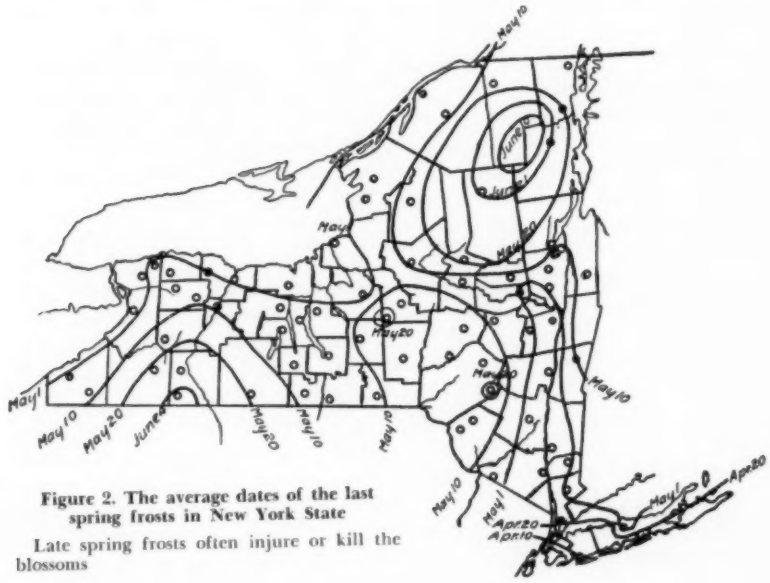


Figure 2. The average dates of the last spring frosts in New York State

Late spring frosts often injure or kill the blossoms

important, because a late frost may injure or kill fruit blossoms, resulting in a loss of the crop. This ofen happens where frost is frequent after May 10.

These maps indicate clearly why the commercial fruit sections border the lakes and the Hudson River. While the actual distribution of commercial plantings follows closely these isothermal lines, they are more or less arbitrary approximations because of the relatively few weather stations and the fact that the temperatures within a given zone may vary greatly depending on the elevation.

Planting Plans

The home fruit planting represents an expenditure in both time and money. Consequently, it should follow a carefully considered plan. The space available and the requirements and preferences of the family serve as a guide in choosing the kinds of fruit and quantities to plant. Thought should also be given to arrangement, spacing, and selection of varieties.

The chart (figure 3) and planting guide (table 1) may be helpful in drawing a plan that will meet conditions and requirements. It is well to remember that a small planting that receives good care may yield more fruit of good quality than a larger planting that suffers from neglect. Ample space should be allowed for all tree fruits to develop without crowding. This is essential in maintaining a bearing surface low enough for pest control.

Table 1. Planting Guide

Fruit	Distance		Bearing age	Approximate yield per mature plant	Ripening period
	Between rows	Between plants			
	Feet	*Feet*	*Years*		
Tree Fruits					
Apple (dwarf)	20	20	5	2 bushels	August to October
Pear (dwarf)	20	20	4	1 bushel	August to September
Peach	20	20	4	2 bushels	August to September
Cherry (sweet)	25	25	7	1 bushel	July
Cherry (tart)	20	20	4	1 bushel	July
Plum	20	20	5	1 bushel	August to September
Small Fruits					
Grapes	10	10	4	8 pounds	September to October
Raspberries	8	3	3	1 quart	July
Blackberries	8	3	3	1 quart	July
Currants	8	3	3	3 quarts	June to July
Blueberries	6	4	4	2 quarts	July to August
Strawberries	3	2	1	1 pint	June

Varieties

Proper evaluation of tree fruit varieties requires many years of observation. The list of standard sorts has been reduced considerably in recent years. Old varieties that are no longer available have been discarded because either the tree or fruit, or both, failed in some essential characteristic. New varieties are constantly being introduced, but they require a lengthy test period to establish their true value. When all the characteristics, such as the adaptability of the tree and the use of the fruit have been considered, the standard varieties should prove best for the home planting.

Varieties of small fruits can be tested rapidly. There has been much improvement recently in these fruits, resulting in a wider choice of higher quality and more

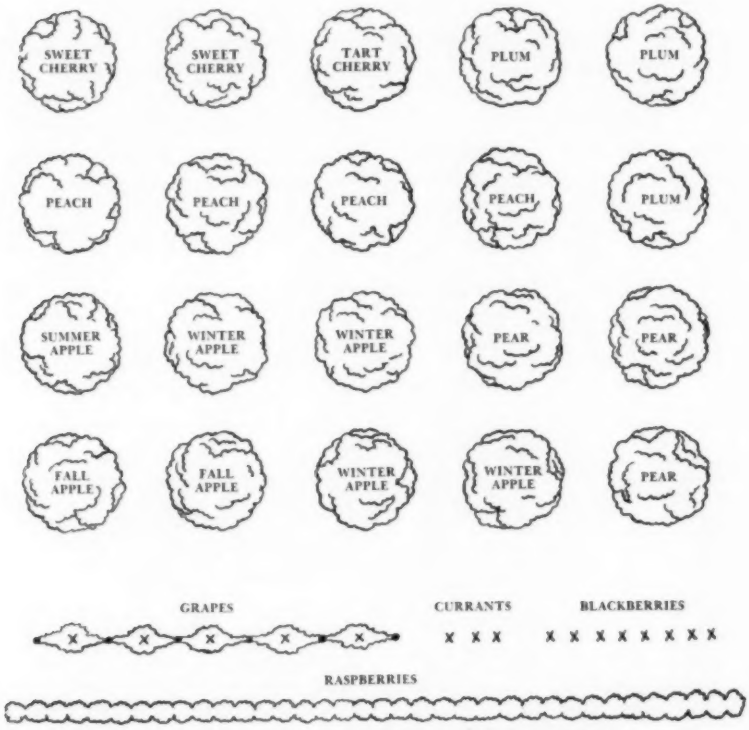


Figure 3. Suggested home fruit planting for family of five

satisfactory kinds than ever before. The varieties suggested here are listed in the order of their season of ripening and should supply fresh fruit throughout the longest period possible in any locality where the particular fruits can be grown. In compiling this list, consideration has been given to adaptabiliy of the various varieties to a wide range of conditions as well as to all those purposes for which fruit is generally used in the home.

Nursery Stock

If apples and pears are included in the home fruit planting, the use of dwarf trees overcomes the objections to the large size attained by trees of these fruits growing on seedling roots. Dwarf apple trees, which reach a height of only 5 to 6 feet at maturity, are produced by the use of a rootstock known as *Malling IX* (figure 4). Pears are dwarfed by grafting on quince rootstock. Not all pear varieties grow

Suggested Varieties for the Home Fruit Planting

Apples
Summer:
Crimson Beauty
Red Astrachan
Lodi*

Fall:
Gravenstein*
Milton

Winter:
Cortland
R. I. Greening*
Northern Spy*
Golden Delicious

Raspberries (red)
Newburgh*
Taylor*

Raspberries (black)
Bristol*
Dundee*

Raspberries (purple)
Marion*

Pears
Tyson
Clapp Favorite
Bartlett*
Duchesse

Plums (prune)
Imperial Epineuse
French Damson*
Stanley*
Reine Claude

Plums (Japanese)
Beauty
Santa Rosa

Blackberries
Eldorado*

Currants
Red Lake*

Gooseberries
Poorman*

Blueberries
Stanley
Pemberton
Jersey

Peaches
Oriole
Raritan Rose (white)
Golden Jubilee*
Halehaven
Belle of Georgia (white)
Elberta*

Cherries (sweet)
Early Rivers
Victor
Schmidt*
Windsor*

Cherries (tart)
Montmorency*

Grapes
Seneca
Portland
Buffalo
Worden*
Delaware*
Niagara
Concord*

Strawberries
Premier
Catskill
Sparkle

*Especially satisfactory for canning or other culinary purposes for which the fruit might be used.

Photo from K. D. Brase

Figure 4. A 14-year-old dwarf apple tree on Malling IX rootstock

Apple trees grown on this rootstock begin to bear in the second or third year after planting

satisfactorily on quince roots. This can be overcome, however, by first grafting a compatible variety, such as Hardy, on the quince root and, following a year's growth, grafting the desired variety on the Hardy stem. Mahaleb cherry seedlings when used as a rootstock have a dwarfing effect on the Montmorency cherry although this effect is somewhat less than that of the rootstocks suggested for apples and pears. When buying dwarf trees, it is important to specify the desired variety-rootstock combination.

Varieties and pollination

For the fruits of apples, pears, sweet cherries, and some plums to set and develop, there must be cross pollination between two varieties of the same fruit. Certain apple varieties, such as Gravenstein and Rhode Island Greening, are not only self-unfruitful but produce poor pollen which is ineffective in setting fruit of other varieties. To be sure of adequate cross pollination, at least three varieties of apples should be planted; while any two of the recommended varieties of pears, sweet cherries and plums should prove satisfactory for this purpose. The Montmorency cherry, all listed varieties of peaches, and the small fruits are sufficiently self-fruitful to set satisfactory crops with their own pollen.

Nursery stock should be purchased from a reliable firm that specializes in the business. One-year-old whips or two-year-old branched trees are preferred to older trees. At this age they can be transplanted with less mortality and more easily trained to a desirable shape. Having decided on the varieties, the order should be placed early. Fruit trees and plants are often injured through improper care after their arrival from the nursery. If the land is not ready for planting when the stock arrives, it should be unpacked immediately and heeled-in on a well-drained spot. The trees can be set temporarily in a trench about 12 to 18 inches deep. They can be placed close together. The soil should be packed firmly over the roots and mounded so that excess water will drain away during a prolonged rain. Small fruits may be cared for the same way. Every effort should be made to set the plants in their permanent location before growth starts.

Preparation of the Soil and Planting

The planting of all fruits should be done in early spring as soon as the ground can be suitably prepared and before the plants have started growth. Plowing and thorough disking of the soil are desirable for most fruit plants and quite important for raspberries, strawberries, and other small fruits.

After preparation of the soil, it is helpful to place stakes where each tree is to be located. The distances should be measured with a tape and the stakes sighted for alignment in both directions. When dwarf apple and pear are planted, all fruit trees can be spaced 20 by 20 feet. The sweet cherry would be the only exception to such spacing. Since there is no satisfactory dwarfing stock for sweet cherry trees, they should be spaced about 25 to 30 feet apart to prevent crowding at maturity.

Before the trees are planted, any broken or injured roots should be trimmed off and long, thin, or straggly roots shortened. Unnecessary exposure of the roots to sun and wind before planting may cause the roots to dry out quickly and lessen the chances of successful transplanting. Holes for the trees should be large enough to accommodate the roots in their natural positions. The top soil should be set aside when digging the hole and thrown in first around the roots. It is important that the soil settle under and around the roots to exclude air spaces. Moving the tree up and down carefully as the first few shovelfuls of soil are thrown in helps to accomplish this. As the hole is being filled, the soil should be stamped firmly. Many failures in transplanting are due to insufficient or improper firming of the soil about the roots.

It is usually suggested that trees and plants be set at about the same depth or an inch or so deeper than they stood in the nursery row.

Dwarf apple trees on Malling IX and dwarf pear trees on quince roots must, however, always be planted with the union between the variety and the rootstock slightly above ground level. If this is not done, the trees, particularly apple trees on Malling IX, may form their own roots on the variety portion of the stem above the graft union and in such cases the dwarfing effect of the rootstock will disappear and the trees will grow to a large size.

The root system of Malling IX is brittle and trees on this stock may break off when the tops become large enough to offer resistance to a strong wind. This can be prevented by providing supports in the form of a stake or post for each tree. A piece of 2-inch galvanized gas pipe makes a permanent and inconspicuous support when driven into the soil. The support should be about 4 or 5 inches from the trunk and should extend several inches above the lowest scaffold limbs. A durable piece of hemp cord or a heavy wire covered with a section of garden hose serves to fasten the trunk to the support. The tie should always be loose enough to prevent binding or girdling as the trunk increases in circumference.

For setting grapes and bush fruits it may be convenient to open a furrow with a light plow. The plants can then be set in the bottom of this furrow and the earth drawn about their roots and pressed firmly.

Somewhat more care is necessary in setting strawberry plants. It is important to have the crown of the plant even with the surface of the ground so that the terminal bud, or growing point, is just above the surface. The plant is likely to rot if planted too deep, and, if planted too shallow, the crown and roots may dry out. When the ground is well prepared, strawberries can be set rapidly and satisfactorily with a garden trowel. As with other plants, it is necessary to firm the soil about the roots.

Culture of Tree Fruits

Soil management

Young trees will not compete successfully with grass and weeds or an established sod. To make normal growth they need clean cultivation or a mulch system. Cultivation, to be most effective, should begin early before the buds start growth and should be discontinued after the first of July. Following this early period of cultivation a cover crop should be seeded. Buckwheat is often used for this purpose, but a combination of rye and vetch which would live over winter is considered better.

If for any reason the cultivation–cover-crop system cannot be followed, equally good results can be obtained by mulching the trees. In fact, dwarf trees seem to respond better to mulching than to cultiva-

tion. Mulching is recognized as an excellent soil-conservation practice. The purpose of the mulch is to suppress grass and weeds, conserve moisture, improve soil structure, and contribute fertility as it decomposes. Wheat straw or any kind of waste hay makes satisfactory mulching material.

The mulch should be applied about 6 inches deep. It will soon settle into a mat less than half this thickness. The mulched area should extend from near the tree trunk to a point somewhat beyond the spread of the branches. In young plantings, the row middles or unmulched area can be seeded to bluegrass or a pasture seeding adapted to the soil and the locality. This should be mowed two or three times each season and the clippings allowed to remain on the ground. If the grass is tall when cut, it may be raked up and used for mulching under the trees. Grass clippings from the row middles seldom supply enough mulching material for the trees. It will be necessary each year to bring in some additional mulching material to replace that lost through decomposition and to extend the mulched area as the trees grow larger.

Rodent control

One of the chief objections to the mulch system of culture is that it encourages field mice. These rodents can damage the tree severely by girdling near the base of the trunk. The most practical way to protect young trees from this damage is to enclose the base of the trunk with a cylinder of ¼-inch mesh hardware cloth (figure 5). This cylinder should be about 6 inches in diameter and extend from several inches below the soil level to the first scaffold branch. Some orchardists have found that mice are discouraged by placing a layer of cinders 4 or 5 inches in depth around the base of the trunk. Baiting the mice runways with poison grain or diced cubes of apples or carrots coated with zinc phosphide reduces the mouse population.

Figure 5. A young apple tree well established by the mulch system of culture and protected from mouse damage by a wire guard

Fertilization

On most soils it would not be necessary to fertilize fruit trees during the first year after planting because the preparation of the soil

and the use of top soil around the roots usually releases and supplies enough nutrients for the first season's growth. The need for fertilizer in subsequent years depends on the soil and on the cultural practice. It is important to obtain good annual growth with a dark-green leaf surface. The liberal use of stable manure, when available, generally gives excellent results. The cultivation–cover-crop system supplemented with moderate amounts of manure should supply the trees with adequate fertility. Mulching with strawy manure is also satisfactory.

When manure is not available commercial fertilizers can be used. They will be needed if cultivation or adequate mulching is not employed. A nitrogen fertilizer, such as sodium nitrate or ammonium nitrate, is usually best for tree fruits. If a mixed fertilizer is used, it should contain at least 10 per cent nitrogen. The rate of application varies with the age or size of the trees. Sodium nitrate might be applied at the rate of ¼ pound for each year the tree has been set. A young tree two or three years old requires about ½ pound, while mature trees should receive from 4 to 5 pounds. If ammonium nitrate is used, the rate should be cut in half since it contains twice as much nitrogen as sodium nitrate. Mixed fertilizers would be used at slightly higher rates, depending on the nitrogen analysis. The fertilizer is sown broadcast beneath the outer spread of the branches and somewhat beyond. The best time to make the application is in early spring as the buds begin to show green.

Freshly applied mulch consisting of wheat straw or any other mature non-legume material should be supplemented with the nitrogen treatments for the first two years. After the mulch mats and begins to decompose on the underside, commercial fertilizers may not be needed if the mulch is replenished as needed.

Pruning

Young fruit trees

Young fruit trees should be pruned during late winter or early spring. It is best to practice very light pruning of dwarf apple and pear trees during the first few years after planting. The principles of pruning dwarfs are the same as for standard trees on seedling roots, but the amount is less because dwarf trees do not grow so large. Dwarf trees should be headed lower than standard trees. The one-year-old unbranched tree should be cut back at planting time to a height of 12 to 18 inches so it will form laterals at a low level. When planting a two-year-old branched tree, two or three well-spaced laterals and a leader are selected for the permanent framework and the other lateral growths are removed. Where many branches that originate close together are left, crowding eventually develops. The lat-

eral branches selected as permanents may be cut back to two-thirds of their original length, although a weaker lateral left because of its desirable location should be cut back less or not at all. The leader or main trunk may be cut back lightly but should be pruned less than laterals in order to maintain its dominance (figure 6). Other branches will arise from lateral buds on the leader at a higher level. Five or six such well-placed scaffolds make up the framework of the mature tree.

Pruning is a dwarfing process and the branch or limb that is cut most makes the least total growth during the following season. This principle may be applied in maintaining a desired balance between various parts of the tree by pruning more severely those branches that are to be discouraged.

The training and pruning that young cherry trees receive during the first few years have an important bearing on the future framework and length of life of the tree.

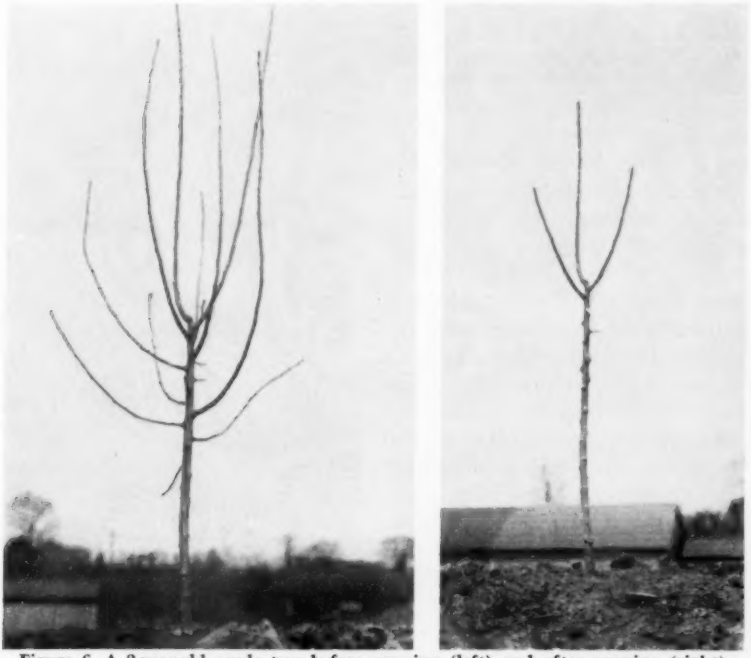


Figure 6. A 2-year-old apple tree before pruning (left) and after pruning (right)

Figure 7. A 2-year-old Montmorency cherry tree as it came from the nursery

At planting time all branches that form narrow angles with the trunk should be removed. If allowed to remain and become a part of the framework, such branches are almost sure to split under a load of fruit or the weight of snow or ice. The bark in narrow-angled crotches is most susceptible to winter killing, which further weakens the branch. Scaffold branches selected for permanents should be equally spaced around the trunk and, where possible, at least 4 to 6 inches apart up and down the trunk. The lowest branch should originate from 16 to 18 inches above the ground level. With most cherry trees as they come from the nursery it is seldom possible to select more than three suitable scaffold branches at planting time. The more vigorous of these may be shortened, but, as with the apple, the main stem or leader should be left longer than any of the scaffolds (figures 7 and 8). Prunes and plums are handled in a similar way.

While the central leader or modified leader system of training is adapted to most kinds of fruit trees, peaches are usually trained to an open center or vase-shaped tree. One-year-old nursery trees are usually from 3 to 6 feet in height with

Figure 8. The same tree as that shown in figure 7, after pruning

The top branch is the leader; the lateral branches which were selected are well spaced and form wide angles with the trunk

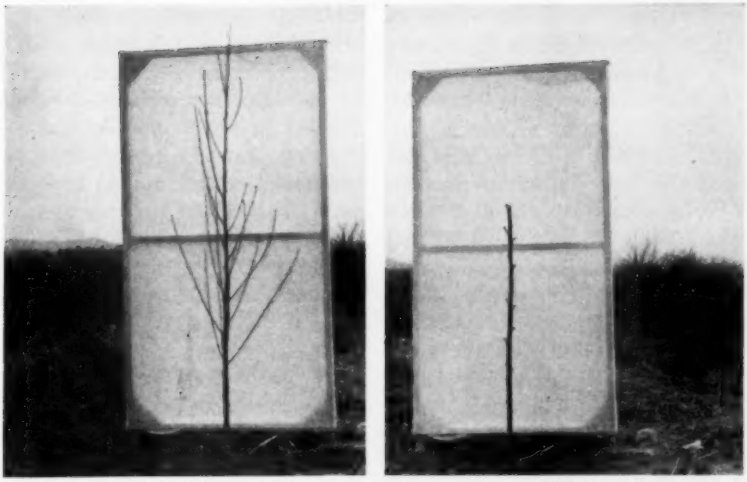


Figure 9. Peach tree before pruning (left) and after pruning (right) at planting time
The laterals are cut to short stubs and the top headed back at about 30 inches

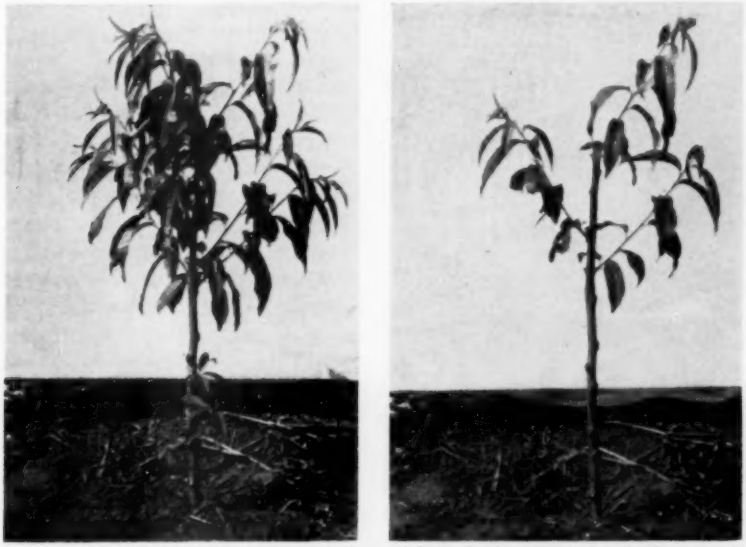


Figure 10. Peach tree before (left) and after (right) selecting shoots for the framework branches

This is called *deshooting*. It would be best to deshoot somewhat earlier before the new growth has developed as much as that indicated in the photograph

some lateral branching. Laterals that were developed in the nursery row as secondary shoots are generally too weak to make good framework branches. It is best to cut such trees back to a height of 1½ to 2 feet and cut off the laterals to short stubs with one bud at the base (figure 9). This encourages the growth of strong shoots on the trunk. As soon as the shoots have grown a few inches, usually by the first of June, three or four of the best ones may be selected for the framework branches and the others removed. Equal growth and branching of these shoots results in an open center tree (figure 10). Occasionally nursery trees have three or four well-developed laterals at a satisfactory level that can be used as scaffold limbs; then the main stem can be cut back to the proper height and the laterals tipped to uniform lengths (figure 11).

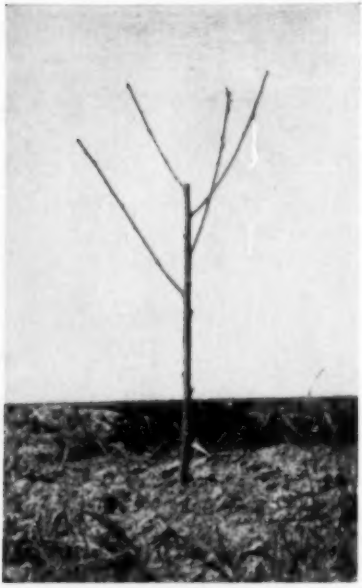


Figure 11. Strong, well-spaced laterals on this nursery tree

These laterals made it unnecessary to cut back to stubs. Four laterals have been selected and the top cut back at about 30 inches

In subsequent years

For apples, pears, cherries, and prunes a few corrective cuts will be needed during the next five or six years or until the trees come into bearing. This pruning should be limited to the removal of water sprouts, crossing limbs that rub against a permanent branch, and the prevention of bad crotches and weak unions that would split and ruin the shape of the tree when bearing a crop. A bad crotch is a fork where two branches of equal length and diameter arise at a common point. Generally, one of two such branches can be removed entirely, but if it seems desirable to save both of them, one should be cut back severely. It will then become smaller and develop as a lateral branch to the unpruned one.

Weak unions are common in some varieties of fruit trees and most varieties of sweet cherries. Often vigorous shoots grow upright against the trunk or against other branches. To prevent this, limbs

that spread out from the trunk at wide angles should be chosen as scaffold limbs and those that tend to grow upright against the trunk should be removed. Only an occasional cut is required for this kind of pruning and it gradually becomes less necessary as the trees come into bearing. Trees that have had proper corrective pruning from the beginning need little if any pruning during their early bearing years. Over-pruning during these formative years delays bearing.

Following the first and second year's growth of the peach tree, the main scaffold branches should be headed back lightly to outward growing laterals. Small shoots crossing in the center may be left since they will bear the first fruits. The purpose of heading back scaffolds is to continue the development of an open-center tree that will be low and spreading for convenience in thinning, spraying, and picking. Pruning during the third and fourth years should be as light as possible, removing only any decidedly crowding limbs or low-hanging branches in the center that are becoming heavily shaded, and heading back to outward laterals any of the scaffold limbs that are getting too high or out of balance with the others (figure 12).

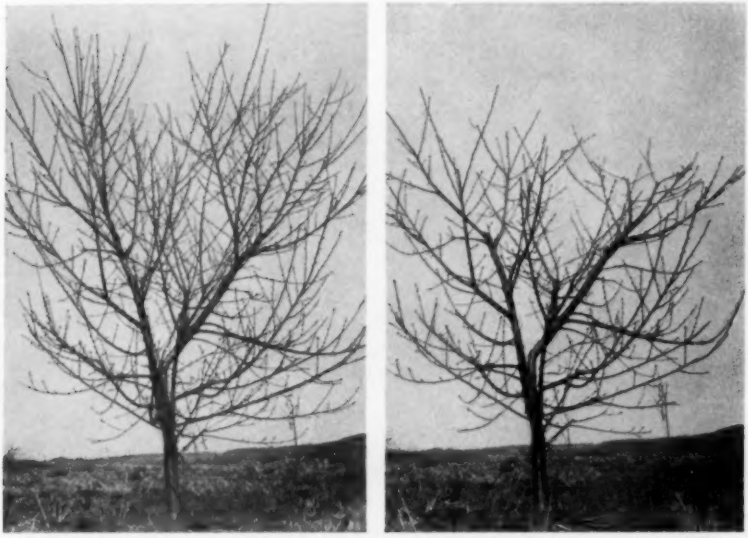
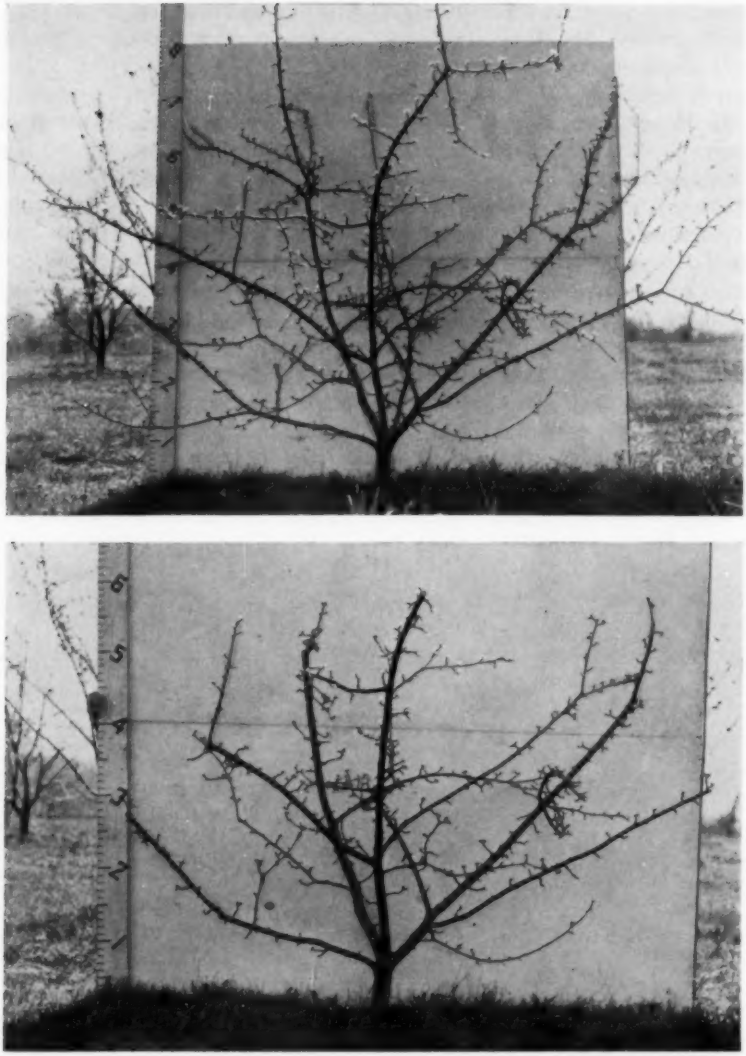


Figure 12. A 3-year-old peach tree before pruning (left) and after pruning (right)

The main scaffold limbs were headed back and a moderate amount of the fine wood removed



Photograph by R. A. Wesselmann

Figure 13. An 8-year-old dwarf apple tree on Malling IX rootstock showing early development of many fruit buds before pruning (top) and after pruning (bottom)

The pruning consisted of heading back the main scaffold branches to keep the tree within bounds and a light thinning of weaker twigs

Pruning mature fruit trees

After fruit trees are well into bearing, more pruning of a slightly different nature will be needed to keep them within bounds and to maintain vigor of the fruiting wood. This pruning should consist of heading back branches that are getting out of control and of removing from the inside of the tree small weak wood or other areas that are becoming dense (figure 13).

Dwarf apple and pear trees, at maturity, often require some heading back of the leader or main branches. Such cuts should be made close to a strong lateral. The height of cherry and plum trees will also need to be controlled. This is accomplished in the same way. In many trees the leader may be taken out at the origin of a scaffold branch, forming a modified leader tree with a distribution of scaffold limbs which in turn can be headed back to secondary branches (figure 14).

Most of the pruning, however, should be small cuts devoted to the thinning out of weak wood in thick, shaded portions of the tree. This type of wood, if it bears, produces poorly colored fruit of low quality. Its removal stimulates the vigor of the remaining fruiting wood and facilitates spraying.

Peaches are borne on twigs of the previous season's growth. As the trees attain full size, rather severe pruning is required to maintain and renew fruiting wood of good vigor throughout the tree and at a low level. Terminal shoot growth of 12 to 15 inches a year is desirable. It is on such growth that the fruit buds are formed and good crops are borne. To obtain this type of growth, cutting back of branches into two- or three-year-old wood is commonly practiced. The cuts should be made to an outward-growing side branch. After heading back all the main branches, it is usually desirable to thin out about a third of the previous season's shoot growth. Peach trees of good vigor produce much

Figure 14. A mature Montmorency cherry tree with a good distribution of scaffold limbs arising from a modified leader which has been cut back to a lateral

Annual pruning consists of a light heading back of scaffolds and moderate thinning of fine wood

more fruiting wood than is needed for a full crop. If some of it is not removed, the tree will overbear and then the fruit will be small and wood growth will be weak for the following crop.

Fruit thinning

Young trees seldom set heavy enough to warrant thinning of the fruit; but after bearing is well established, some attention should be given to this practice. This is especially true with peaches and some varieties of plums, prunes, and apples. When the set is excessive, proper thinning results in larger, better colored and higher quality fruits. Thinning should be done early, from two to three weeks after bloom if possible.

Where fruits are clustered, all but one fruit in each cluster should be removed. Peach fruits should be from 4 to 8 inches apart, using the wider spacing for the early varieties. Plums and prunes should be thinned so that the fruits are four to five inches apart. The small, insect and disease injured fruit should be removed first.

An excessive set on apples prevents flower-bud formation for the next season and results in alternate bearing or a heavy crop of small sized fruit one year and no crop the next. This is a common occurrence with Golden Delicious and some other varieties. It can be prevented by early thinning. Apples should be spaced from 4 to 6 inches apart, which means one fruit on every third or fourth spur. Thinning actually requires very little time and the improved size, quality, and repeat bloom are well worth the effort.

Culture of Small Fruits

Soil management and fertilization

Grapes and the bramble fruits, including all raspberries and blackberries, should be cultivated during the spring and early summer, after which weeds or a seeded cover crop may be allowed to grow. During the second and succeeding years, if manure is not available and plant growth is poor, one of the nitrogen fertilizers, such as nitrate of soda, ammonium nitrate, or a mixed fertilizer high in nitrogen, may be used. For grapes, from ¼ to ½ pound of sodium nitrate is suggested for each vine. If the cane growth of brambles is unsatisfactory because of a nitrogen deficiency, 6 pounds of nitrate of soda per 100 feet of row should meet the requirements. Ammonium nitrate is used at one-half these amounts. Fertilizer for grapes and brambles may be scattered broadcast between the rows.

Grass and weeds under the grape trellis may be controlled by mulching. If mulch material is available for this purpose, commercial fertilizer will probably not be needed. While brambles respond to mulching, this practice often results in a late vigorous growth of canes that are susceptible to winter injury.

Figure 15. A healthy currant bush

A heavy mulch of grass clippings applied each spring has helped to keep this Red Lake currant bush vigorous and productive

Shallow cultivation during the spring and early summer is the best system of culture for brambles.

Currants and gooseberries, because they are among the hardiest of the deciduous fruits, can be grown quite satisfactorily by mulching. Two bushels of fresh grass clippings placed around each bush annually in the early spring seems to meet all the cultural requirements for these fruits on most soils (figure 15).

Training and pruning grapes

The grapevine is pruned to control the quantity and quality of both wood growth and fruit production. In pruning, it is the aim to leave enough of the best fruiting wood to obtain maximum production of good clusters and to remove the surplus to prevent overbearing and its consequent inferior wood growth. This is *pruning* proper. Pruning is also employed to make well-proportioned vines that are easily managed and kept within definite bounds. This is more correctly termed *training*. Both operations are often referred to as pruning, but the two terms should not be confused.

The grape lends itself to almost any desired system of training or distribution of the bearing surface. For this reason there are many systems. Only one is discussed here; namely, the Kniffin system. It is easy to train vines to this system which requires no summer tying and is as well if not better adapted

to the home garden than any other system.

A trellis is necessary for support and should be erected at planting time or shortly thereafter. The trellis for the Kniffin system has two or three wires (usually No. 9 or No. 10 wire) strung tightly between posts. The lower wire is placed from 2½ to 3 feet from the ground and the upper wire at the 5- or 6-foot level. The post should be 8 feet long, set 2 feet in the ground, and 20 feet apart. This spacing allows two vines between each two posts. Posts of some durable wood, such as locust or cedar are preferred. The end post should be well braced.

Figure 16. A vigorous young grape vine pruned to form the trunk after the first season's growth

A vine trained according to the single-stem, four-cane Kniffin system consists of a single trunk that reaches to just below the top wire. After each annual pruning from two to six canes, bright brown wood of the previous season's growth, are left. These canes arise from spurs or short arms of 2-year wood and extend out on the wires in both directions from the trunk. From buds at the nodes of these canes, leafy shoots grow and bear the clusters of fruit. These shoots in turn become canes the following year. When this fruiting habit of the grape is kept in mind, training and pruning of the vine becomes quite simple.

At planting time the vine is cut back to two buds. Both buds will likely grow into shoots, in which case the lower or weaker one may be allowed to trail on the ground until its removal the following year. The most vigorous or upper shoot should be supported in an upright position with a stake to keep it straight and prevent breakage. This becomes the permanent trunk, and as growth proceeds it should be tied loosely to the wires of the trellis or the supporting stake until the trellis is constructed. When good growth is obtained, the trunk may be formed the first season (figure 16). The next spring it is cut

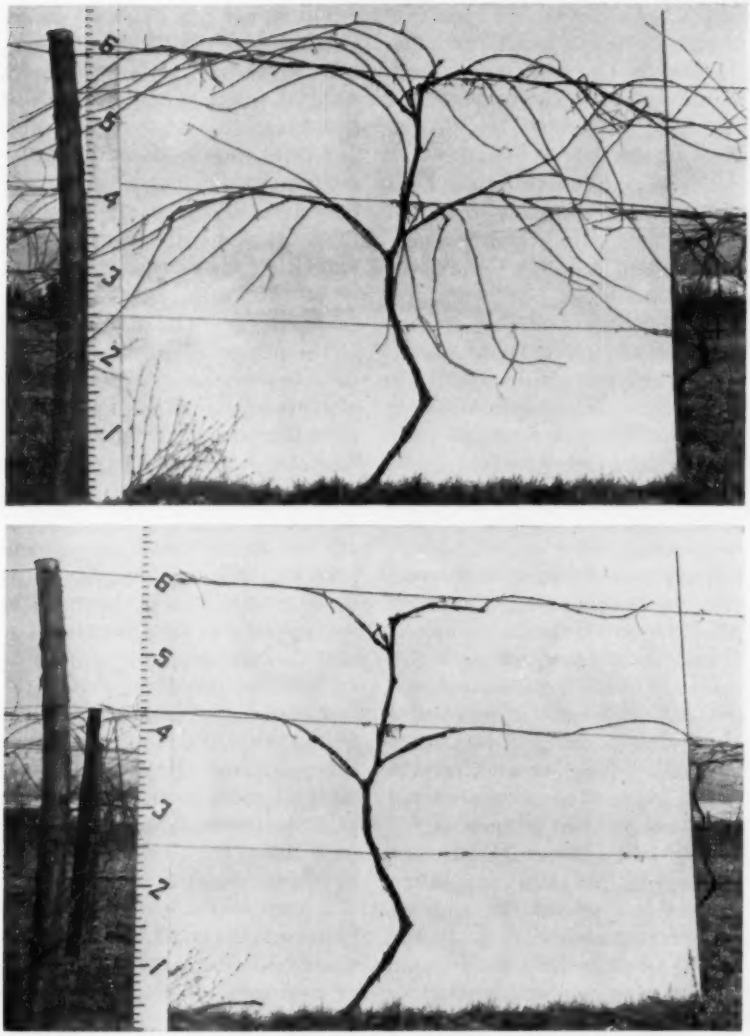


Figure 17. A grape vine trained according to the four-cane Kniffin system; unpruned (above) and pruned (below)

The one-year prunings from this vine amounted to 1.8 pounds. There were 38 buds left on the vine after pruning

off just below the top wire and tied firmly in place. If growth is not so vigorous the first year, the best cane should again be cut back to two buds and the process repeated to form a trunk.

The first canes to be trained horizontally along the wires arise from lateral buds on the young trunk. After that, canes can usually be selected from basal buds of the previous year's canes or from renewal spurs left for that purpose. An unpruned and pruned vine trained to the single-stem, four-cane Kniffin system is shown in figure 17.

Once the training system is established the vines must be pruned annually. The amount of wood or more correctly the number of buds to leave should be governed by the vigor of the vine. This may vary from 30 to 60 buds. A mature grapevine of moderate vigor limited to 10 feet of trellis space should not ordinarily carry more than 40 buds. The prunings from such a vine should weigh about 2 pounds, which is a good measure of its vigor. No more than 60 buds should be left on the most vigorous vines where the prunings would approximate 6 pounds. Leaving too many buds for the vigor of the vine greatly weakens the growth for the bearing of succeeding crops and the clusters become small, loose and the berries inferior. Since a mature vine before pruning may have several hundred buds, it is apparent that grapes require a rather severe pruning.

The most productive canes should be saved for fruiting. These will be about ¼ inch in diameter with an internode length of 5 to 8 inches. Canes of small diameter and short internodes or those that taper rapidly are unproductive and should be discarded. By watching the vines closely, the amateur can soon learn to balance the amount of pruning with growth and production.

The productivity of the canes on the lower wire is not so high as that of canes on the upper wire. If more than four canes are needed to obtain the proper bud number, the extra one or more canes should be put on the top wire. On vines that are low in vigor and cannot support the buds on four canes, the bottom canes may be shortened to spurs until vine vigor is restored.

With canes placed in a horizontal position, the shoots toward the end of the cane usually make the best growth. To have productive canes originate close to the trunk, two-bud spurs should be left in such positions. Shoots will arise from these renewal spurs and serve as fruiting canes the next year. In this way the vine is kept in bounds.

Because the grape has a long productive life and is on its own roots, it is possible to renew old vines that have gotten out of bounds and trail for great distances. The pruning that can be done the first year will consist of limiting the vine to a few new canes originating as close to the trunk as possible. A good vig-

orous sprout coming up from the root or at a low level on the trunk should be retained and tied to the wires of the trellis for the purpose of renewing the old trunk. This sprout is handled like a young vine, and after several years the old trunk can be cut away entirely. A vine that fails to send up a sprout or sucker may be cut off at the ground to force such growth. Of course in such a case immediate fruit production is sacrificed.

Occasionally someone wants to grow grapevines on arbors, porches, and elsewhere to furnish shade as well as fruit. In such instances the same principles of pruning are followed although the method of training must be modified. The principal difference is the amount of old wood left, the number of buds retained, and the distribution of the fruiting canes. Usually, the trunk is longer, and in some instances it is desirable to leave short permanent arms coming from the trunk. More fruiting canes and spurs and consequently more buds may be kept than would be desirable on a vine confined to less space, because such arbor vines in a favorable environment eventually develop a larger root system and trunk. It therefore has more capacity. In other words, when grown for the purpose of shade, the trunk of the vine is carried to the necessary height, and permanent lateral arms and yearling canes are trained in such a way that the shoots bearing the foliage will cover the arbor to the best advantage. Even then the necessary renewal pruning should be given annually for best results.

Pruning brambles and bush fruits

For bramble fruits, the two-year-old fruiting canes should be removed as soon as the harvest is completed. Of no further use, these tend only to spread disease to the new shoots. The old canes should be cut off close to the ground.

Black raspberries, purple canes, and blackberries respond to summer pinching of the new shoots. The tip ends of the shoots are pinched off when they have reached a height of from 18 to 24 inches, which is usually in early June. When the shoot is pinched back, it stops growing at the end and the buds on the side push out to form lateral branches. Plants treated in this way are lower and more self-supporting.

Red raspberries produce suckers freely and for this reason are commonly grown in hedge rows about 2½ feet in width. Sprouts appearing in the row middles should be destroyed, else the patch will become a thicket of weak canes. The new shoots of red raspberries should not be summer-pinched, because laterals forced by this treatment are subject to winter killing. Before growth starts in early spring, the unbranched canes are cut back to a height of about 3 to 4 feet. The weakest canes should be removed. In plantings where cane growth is exceptionally vigorous, red rasp-

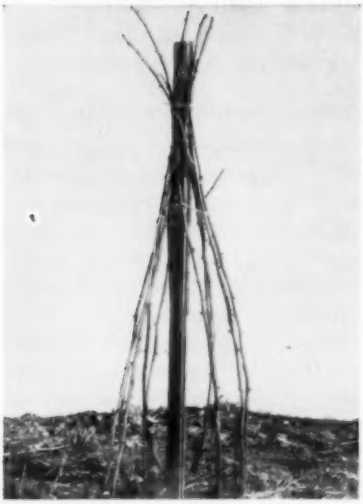


Figure 18. A hill of vigorous red raspberry canes pruned to a height of 5 feet and supported by a stake

berries may be kept in hills and supported by a stake (figure 18). This leaves vigorous canes and takes advantage of their greater fruiting capacity. It also simplifies picking.

In the spring, black raspberries, purple canes, and blackberries are pruned to shorten the lateral branches that developed as a result of summer pinching. The laterals on blackcaps and purple canes are cut back to 5 or 6 inches (figure 19); those on blackberries are left from 10 to 12 inches. The weak, spindling canes are cut out entirely.

The pruning of currants and gooseberries is governed by the fact that 2- and 3-year-old wood is the most fruitful. In pruning, therefore, branches older than four years are cut out at the ground, as are the weakest of the young shoots.

Care of strawberries

The ground for strawberries should be thoroughly prepared by working it to a fine mellow condition to a depth of 6 to 8 inches. A liberal application of rotted compost or a high-grade garden fertilizer thoroughly incorporated in the soil at the time it is prepared should meet the fertility requirement of strawberries on most soils.

Early spring is the best time to set strawberry plants. They should be set as soon as the ground can be prepared. The plants become established and start growth quickly during the cool days of late April

Figure 19. A purple raspberry plant after spring pruning

The lateral growths which resulted from tipping the previous summer have been shortened and the weak canes eliminated

or early May when there is usually a good supply of moisture. Early planting also encourages the formation of early runner plants that are more productive and bear better quality fruit than those formed in late summer.

Only well-grown healthy stock should be planted, and only those plants that were formed from early runners the previous season are worth consideration. A trowel or dibble is a handy tool for setting strawberry plants in well-prepared soil. The holes should be large enough to accommodate the roots without doubling or wadding them together. The plants should be set firmly and at the same depth as they previously grew. When the crown is set too high, the plants may dry out; and when set too deep, the mortality will likely be high.

Frequent but shallow cultivations or hand hoeings are needed to maintain a fine surface mulch and to destroy the weeds that would take moisture and nutrients from the plants. Cultivation should be started soon after the plants are set and repeated every ten days or two weeks or after every rain until weeds are under complete control and enough runner plants have set to form the matted row.

Some of the buds within the crowns of the newly set plants are flower buds that were formed the preceding fall. When the plants begin growth, these buds push out stems that terminate in flower clusters. All flowering stalks should be carefully pinched off as they appear, preferably before the blossoms open. The untimely development of flowers and fruits decreases the vigor of the plants and retards runner production. The more frequently the new planting is deblossomed, the better the results will be.

Runners from the parent plant take root and form new plants, and these in turn send out runners to form more plants. In this way the matted row develops (figure 20). It is the most practical system for training strawberries and is well adapted to the home garden. The one fault of the matted-row system as commonly practiced is that too many plants may form. This is especially true in a favorable growing season. Many of these plants are produced late in the season, are small, and have little capacity to bear, yet they use soil moisture and nutrients that retard the development and reduce the production of other plants. Some of the late formed plants might be regarded as "strawberry weeds."

A little attention to spacing and thinning of runner plants during the summer usually increases yield and a high-quality fruit. The early plants can be spaced by covering the runners with a little soil just back of the leafy tip so that they will strike root about 6 or 7 inches apart. From four to six plants per square foot are enough and any excess should be removed. The

Figure 20. A strawberry planting showing well-developed matted rows

width of the matted row should be confined to about 2 feet by cutting off runners beyond these bounds. Much of this can be accomplished while hoeing and weeding the planting.

The strawberry planting needs to be mulched as an insurance against winter injury. If plants are unprotected, the low winter temperatures may kill the fruit buds and cause injury to the roots and tissues of the crown. Mulch, if not removed too early, delays bloom in the spring and in this way affords protection against a late spring frost. Part of the mulch left on the rows during harvest helps to conserve moisture, to smother weeds, and to keep the berries clean.

Wheat straw or marsh hay are ideal mulch materials. Oat straw, rye straw, or leaves are often used but are considered inferior to clean wheat straw.

The mulch should be applied sometime during the first three weeks of November, depending on the section. By this time the plants have usually been exposed to several frosty nights, growth has been retarded, and the hardening processes have set in. A light frost will not injure the plants, but they should be protected before there are temperatures of 15° to 18° F. The mulch should be spread uniformly over the planting. If, however, there is a scarcity of material, the tops of the rows should be mulched rather than the middles. Usually a mulch about 2 inches in thickness, when settled, gives ample protection. This requires about 15 pounds of dry straw per 100 square feet.

The following spring when an inspection of the plants shows new leaf growth or a slight yellowing of the foliage, the mulch should be

opened over the rows. From one-half to two-thirds of a heavy mulch needs to be forked off the plants and tramped down in the row middles. The plants will grow up through that which remains. In removing mulch, the aim is to leave some of the material around the base of the plants to keep the berries clean and to conserve moisture.

After the first crop is harvested, it is customary to keep the planting intact for a second one. When good care has been practiced, one has only to pull out weeds as they appear and add a little mulch over the rows for protection during the next winter. It is seldom advisable to save the planting for a third crop.

Blueberry culture

Blueberries are more specific in their cultural requirements than are other small fruits. The natural habitat of the high-bush blueberry is usually the lowland swamp or hammock where relatively moist, acid (pH 4.0 to 5.0) soil conditions prevail with a shallow, year-round water table. The shrub has a shallow, fibrous root system that grows largely in the leaf mold and humus layer above the water table. Thus, this natural habitat supplies a maximum of both oxygen and moisture throughout the root zone.

Recent nutritional work with blueberries has shown that this plant grows vigorously even at pH 6.5 if the soil is well aerated and the necessary nutrients are maintained in an available form, or they fail to grow at pH 4.5 with inadequate aeration and nutrients. As compared with other fruit plants, blueberries seem to have a relatively low requirement for potassium, calcium, and phosphorus, and a high requirement for iron, manganese, and possibly magnesium. They respond vigorously to nitrogen and apparently absorb nitrogen in the ammonia form more readily than in the nitrate form.

Most soils with a pH value of 5.5 to 6.0 are fairly well supplied with calcium, but are low in available iron and manganese and the nitrogen is likely to be largely in the nitrate form. In addition, many of these soils have a clay texture, are somewhat poorly aerated, and are subject to drying near the surface in summer. These may be the principal reasons why blueberries usually fail on soils of this type.

Such soils may be modified to meet better the requirements of blueberries if one wishes to grow them in the home fruit planting. Where the land is level and internal drainage is slow, the row on which the plants are set should be ridged about 18 to 24 inches high. The ridge needs to be about 2 feet wide, which means that the rows must be spaced 7 to 8 feet apart in order to afford enough top soil to construct the ridges. The reason for planting on ridges composed mainly of top soil is to furnish the best possible drainage and provide a medium open and porous enough

in texture to encourage growth of the fine, fibrous roots.

High or sloping ground with good internal drainage need not be ridged. It is important, however, that the soil be well supplied with organic matter for the retention of moisture and nutrients. Nitrogen is held against loss from leaching, and some other nutrients are maintained in a more available form by organic matter. Organic materials may be added in the form of peat, sawdust, muck, compost, straw, or wood chips. Such materials may be raked or otherwise incorporated into the soil before planting.

An acid soil is desirable. A soil pH of 4.0 to 5.2 should exist for the prevention of iron deficiency and the maintenance of nitrogen in the ammonia form. Under acid-soil conditions well supplied with organic matter, nitrates are converted into ammonia nitrogen that is freely utilized by blueberry plants. As the soil becomes less acid, above pH 5.5, nitrifying organisms predominate and ammonia nitrogen is converted into nitrate nitrogen that is used to a less extent by the plants and is easily leached from the soil. Thus it becomes more difficult to maintain adequate nitrogen for the plants.

Loam soils not normally acid enough for blueberries (pH 5.5 to 6.5) may be improved by the addition of 5 pounds of sulfur per 100 square feet. This should be worked into the soil the year before the planting is made. Sulfur should be applied very sparingly, if at all, after the plants are established. Ammonium sulfate has an acidifying effect on the soil. In many cases the use of ammonium sulfate as a fertilizer and a heavy organic mulch will be enough and will eliminate any need for sulfur (figure 21).

If mulching material is scarce, shallow tillage may be used to control weeds and grass. Blueberry roots are near the surface and are therefore easily destroyed by tillage. A heavy mulch combined with hand weeding is preferred to any form of cultivation. Mulching is desirable to maintain a good structure of the surface soil so that water will penetrate freely and to prevent heaving of the plants and subse-

Figure 21. A 4-year-old blueberry bush mulched with sawdust and fertilized annually with ammonium sulfate

This bush is on well-drained Dunkirk silt loam (pH 5.3). It is 4 feet high and bears 3 quarts of fruit annually

quent root injury in the early spring. Sawdust is one of the best mulching materials, although other materials may be used with beneficial results. Any kind or age of sawdust may be used and applied whenever convenient. From 3 to 6 inches of mulch should be maintained, the amount of annual renewal depending on the rate of decomposition.

Where a mulching system is used, nitrogen will probably be the only fertilizer element needed and this should be in the ammonium form. Ammonium sulfate is the best choice. If ammonium sulfate cannot be obtained, ammonium nitrate may be used. Fertilizer is not used at planting time, but the following year ammonium sulfate should be applied at the rate of 1 to 2 ounces per plant in early May and again in mid-June. The rate should be increased as the plants grow older until mature plants, from five to six years-of-age, receive from ½ to ¾ pound annually, depending on their size. In applying the fertilizer, scatter it uniformly over the surface of the mulch from ½ to 3 feet from the center of the bush, exercising care to prevent any deposit on the foliage.

The requirements of blueberry plants for other nutrients, such as potassium, phosphorus, calcium, magnesium, and the like, are very low and adequate quantities are usually present in most soils, especially under a mulch system of culture. In very acid sandy soils, a complete fertilizer and possibly dolomitic lime (calcium and magnesium) may prove beneficial, but the dolomitic lime should not be applied to soils above pH 5.0.

Iron deficiency, indicated by a chlorotic condition of the young leaves, is usually caused by a lack of soil acidity. It may be temporarily corrected by a foliage spray of 1 per cent ferrous sulfate or the incorporation of ferrous sulfate in the soil. In soils not acid enough for blueberries, the soil applications are soon converted to unavailable forms and the leaf symptoms are again evident on the new growth.

Blueberries suffer considerable damage from an extended drought. A good supply of moisture should exist throughout the shallow-root zone until well after the harvest. A prolonged dry spell during and following harvest greatly reduces fruit-bud formation for the next crop. About 1 inch of rain each week during July and August is required by a mature planting. Any deficit in rainfall during this period should be made up by irrigation. This can be accomplished in the home planting by attaching a suitable sprinkler to the garden hose and applying the water in late evenings when evaporation is at a minimum.

The fruit of the blueberry is produced on wood of the previous season's growth. Strong shoots from the base of the plant or vigorous laterals from the older canes pro-

duce the best berries. Little or no pruning is required the first two or three years, but older bushes, if not properly pruned, overbear and produce large quantities of small, worthless berries. Bearing branches close to the ground should be removed as well as dead and broken branches. Dense areas of weak, twiggy growth should be thinned by cutting back to vigorous side shoots. Occasionally old, weak canes which produce no strong laterals are cut out in favor of younger shoots that will grow more vigorous fruiting branches.

Disease and Insect Control

Any discussion of fruit culture would not be complete without some reference to spraying. Timely spraying is required to protect both plants and fruit from injury by those diseases and insects that may be present on the premises. Spray schedules and other information on this subject may be obtained by writing the Mailing Room or the Department of Plant Pathology or the Department of Entomology at the New York State College of Agriculture, Cornell University, Ithaca, New York.

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